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PATENT SPECIFICATION



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COMPLETE SPECIFICATION.

Improved Free-wheel and Brake Hub for Bicycles.

I, PROSPER BOURGARD, Engineer, of rue Moulin en Rhuyff, Dolhain, Belgium, of Belgian nationality, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to an improved free-wheel and brake hub for bicycles and has for its main object to provide a hub of the kind referred to which will be simpler and easier of construction and more satisfactory in operation than the known types of such hubs, and which will admit of its parts being more readily taken to pieces and assembled and will make it possible to obtain a better lubrication by permitting the use of petrol jelly or the like as a lubricant.

My invention more particularly relates to the type of free-wheel and brake hub which comprises an expansible drum or nut mounted within the hub casing or barrel and having its inner surface provided with peculiar-shaped female threads in engagement with corresponding male threads of a driving member rotatively mounted on the wheel axle and carrying the chain sprocket.

I am aware that it has previously been proposed to provide in a hub a spirally wormed sleeve carrying on one end the chain sprocket, in combination with a segmentary drum whose inner surface is hollowed out to correspond with the waves of the sleeve and having teeth at one end to engage with the ratchet teeth of a stationary crown-wheel fixed on the wheel spindle at the end of the sleeve.

In this construction, in view of the fact that the teeth are cut in the end of the segments of the segmentary drum itself, when the said segments are caused to expand radially to obtain the brake action the radius of the arcs of teeth

formed by the toothed ends of the segments remains unchanged while the said arcs move bodily away from the centre of the hub, so that the centre of the said arcs ceases to be co-axial with the centre of stationary crown-wheel, with the result that the teeth of the segments do not any more fit exactly those of the said crown-wheel and that the said parts are thus liable to become jammed in the braking position.

In another known construction, the expansion of a segmentary drum engaged by the threads of a driving body is for the purpose of driving the hub casing or barrel assisted by means of a conical flange bearing on the one hand against a shoulder of said driving body and engaging on the other hand into one end of the segmentary drum, while the other end of the latter has an inner conical surface provided with longitudinal teeth which are, for the purpose of braking, capable of engaging peripheral teeth cut in a manner similar to those of a bevel wheel in a conical shoulder of the adjacent stationary ball-bearing cone.

In both of the known constructions referred to, the segmentary drum or nut is formed of a plurality of separate segments held together by an expansible band or the like.

Now, according to my invention no teeth are cut in the end of the segmentary drum for engaging those of a stationary member for the purpose of braking, but the segmentary drum or nut has a removable tooth-ring, forming a part distinct from the said nut, fitted in one end thereof in such a manner that it is compelled to rotate and move longitudinally with the nut without however being affected by the movement of the segments of the latter as far as radial expansion is concerned, the said tooth-ring being capable of engaging ratchet teeth cut in the face of the corresponding stationary ball-bearing cone.

[Price 1/-]

Another feature of my invention consists therein that the segmentary nut forms a single part having a plurality of longitudinal slots at intervals of its circumference starting alternately on one end and the other to finish near the respectively opposite end.

Further, according to my invention, the end of the segmentary nut which has the tooth-ring fitted therein is formed externally with a conical shoulder for engaging a corresponding conical portion of the hub-casing, as will be explained in greater detail hereafter.

In order that the invention may be more readily understood one embodiment of same is, by way of example only, illustrated by the accompanying drawing, wherein:

Fig. 1 is a longitudinal section through one form of the improved hub according to the invention.

Figs. 2 and 3 are respectively a longitudinal section through and an end view of the segmentary nut, and

Figs. 4 and 5 are respectively a side and an end view of a toothring forming a part of the hub referred to.

Referring to the drawing, 1 indicates a hub casing of which the end portions are suitably formed internally to form outer ball races for the ball bearings, the bore of the said hub casing 1 being cylindrical except adjacent one end, to the left hand side of Fig. 1, where it is made conical. It is to the outer flanges 1¹ of this hub-casing 1 that the spokes connecting the hub to the rim of the wheel are secured.

2 indicates a sleeve mounted on the axle 8, provided with a double right handed screw thread of triangular section and which forms towards one end, a cone constituting an inner ball-race for a ball-bearing. The said end of the sleeve 2 is further provided with a right handed screw thread to receive the chain pinion 3 and with a left handed screw thread to receive a lock nut 4 which prevent the chain pinion 3 from becoming loose.

5 indicates a segmentary nut preferably made of gun metal, this nut having a plurality of longitudinal slots 5¹ cut therein at intervals of its circumference (see Figs. 2 and 3) so as to divide the said circumference into a number of segments forming each an arc of a circle. The said slots 5¹ are made to start alternately from one end and the other of the nut 5 to finish near the respectively opposite end, i.e. they are in staggered formation.

The said nut 5 is provided internally with a double right-handed screw-thread of triangular section engaging the screw

thread of the sleeve 2, and has one end made conical as shown to fit the corresponding conical portion of the hub casing 1. In this conical end of the nut 5 the slots 5¹ are made wider to receive radial projections 6¹ provided on a steel tooth-ring illustrated in detail by Figs. 4 and 5. The conical bore of the said end of the nut 5 is made to suit the conical surface of the steel ring 6 between the projections 6¹, and the end in question of the nut 5 further has a circular flange 5¹¹ adapted to retain the said toothring 6 when the latter is in position in the corresponding space within the conical end of the aforesaid nut 5. The insertion of the ring 6 is made possible owing to the elasticity due to the nut 5 being segmented. The toothring 6 is thus compelled to follow the movements of the segmentary nut 5 both rotatively (owing to the engagement of the projections 6¹ in the widened ends of the corresponding slots 5¹) and longitudinally (owing to the engagement of the periphery of the annular faces of the ring 6 with the annular shoulder at the bottom of the conical bore of the nut 5 and the circular flange 5¹¹ of said nut respectively).

7 indicates a cone screwed onto the axle 8 and forming the inner ball-race for the ball-bearing to the left hand side of Fig. 1; this cone 7 has its face adjacent the conical end of the nut 5 cut to form ratchet teeth capable of engaging those of the toothring 6, and the outer face of the cone 7 has a diametral groove formed therein to receive a lever arm 9 by means of which it is rigidly connected to the frame of the bicycle. As a consequence, the cone 7 is maintained stationary. The axle 8 has a longitudinal groove 8¹ formed therein to receive a pin 10¹ provided to prevent the rotation of a ring 10 fitted on the axle 8 within the toothring 6. The said ring 10 has its outer periphery formed with a circumferential groove in which is located a blade spring 11 having one of its ends free and which almost entirely surrounds the ring 10 and exerts a slight pressure on the inner periphery of the tooth ring 6.

12 indicates a cone forming the inner ball-race for the ball-bearing within the end of the sleeve 2 carrying the chain pinion 3, the said cone 12 being here shown screwed onto the axle 8; it may however be made in one piece with the said axle.

13 indicates a thin washer having a small projection engaging the longitudinal groove 8¹ of the axle 8, and 14 is a washer having a concave surface

against which bears the convex surface of a nut 15 screwed onto the corresponding end of the axle 8.

5 The nut 15 in cooperation with the washers 14 and 13 serves to maintain the parts of the hub in position in relation to the cone 12 on the opposite end of the axle and thus prevents said parts from becoming ill-adjusted.

10 16 and 17 indicate the brackets formed at the ends of the corresponding frame member of the bicycle to carry the rear axle, which is maintained by means of the nuts 18 and 19, this latter nut having the usual extension to provide a step for the cyclist's foot when mounting onto the bicycle.

The operation of the above described improved hub is the following:

20 Referring to Fig. 1, which shows the normal position of the parts, i.e. the position when it is desired to drive the rear wheel of the cycle; the chain pinion 3, driven through the medium of the chain, causes the rotation of the sleeve 2 of which the double right handed thread draws the segmentary nut 5 towards the right until its conical end fits snugly in the corresponding portion of the hub casing 1 and thus causes through friction the rotation of the said hub casing and thus of the wheel. The wheel is thus driven.

35 When the cyclist stops pedalling and the chain pinion 3 consequently stops rotating, the hub casing 1 continues rotating for a time and therefore momentarily causes the segmentary nut 5 to continue following its movement of rotation but, as the sleeve 2 has stopped rotating simultaneously with the chain pinion 3 the said segmentary nut owing to the engagement of the male and female triangular screw threads of the sleeve 2 and the nut 5 respectively moves towards the left and its conical end becomes disengaged from the corresponding conical portion of the bore of the hub casing 1 so that the latter is able to rotate as a free-wheel. If, in order to obtain a brake action, the cyclist pushes the pedals backwards, the chain pinion 3 causes the sleeve 2 to rotate in a direction which owing to the double triangular screw thread thereof being right handed causes the segmentary nut 5 to move towards the left until stopped from moving further by a suitable abutment constituted by that face of the cone 7 which is provided with teeth, with which the teeth of the toothring 6 fitted in the conical end of the nut 5 snap into engagement, and as in consequence the segmentary nut 5 is then unable either to rotate or to move any further to the

left while on the other hand the triangular screw thread tends to impart to it such further movement, the sloping portions of the female thread of the segmentary nut are so to speak caused to "climb" on the sloping portion of the male thread of the sleeve 2, which results in the segments of the nut 5 being forced radially towards and against the inner cylindrical surface of the hub casing 1 so as to stop the latter's rotation by friction; the brake action is thus obtained. When subsequently the chain pinion 3 will be rotated in the initial direction again the segmentary nut 5, owing to its elasticity and to the cooperation of its triangular screw thread with that of the sleeve 2, will return to the position indicated in Fig. 1.

The spring 11 is provided to exert a suitable braking action on the nut 5 to stop the tendency to continued rotation thereof when becoming disengaged from the conical portion of the hub casing. The engagement of the toothring 6 with the teeth of the cone 7 is thus rendered impossible when the cyclist makes free-wheel. This spring 11 further prevents the nut 5 from rotating together with the sleeve 2 on back-peddalling to obtain the brake action; the rotation of the nut 5 being thus stopped the triangular screw thread causes same to move towards the left.

It will be obvious that several modifications of details may be made. For instance, instead of providing the sleeve and the segmentary nut with a double screw thread they may be provided with a single or multiple screw-thread. Further, the hub might be constructed to allow its removal without having to regulate anew the tension of the chain when mounted in position again.

110 It will be apparent that several other structural modifications are possible without departing from the spirit and scope of the invention as defined in the appended claims.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Improved free-wheel & brake hub for bicycles, of the type comprising an expansible nut having its inner surface provided with threads in engagement with corresponding threads of a driving-member, characterized by the provision in combination with a hub casing and a sleeve carrying the chain sprocket and provided with triangular or equivalent screw-threads of a correspondingly threaded segmentary nut bearing a plur-

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ality of longitudinal slots at intervals of its circumference extending along the greater portion of its length starting alternately from one end and the other, 5 and a removable toothring fitted in one end of said segmentary nut in such a manner that it will follow the movements thereof rotatively and longitudinally, 10 said toothring being capable of cooperating with ratchet-teeth cut in one face of a stationary element rigidly connected to the bicycle frame in such a manner that back-peddalling will result in the segments of the segmentary nut being forced 15 radially against the inner surface of the hub-casing.

2. Improved free-wheel and brake hub for bicycles, as claimed in Claim 1, char-

acterized by the fact that the end of the segmentary nut having the toothring 20 fitted therein is formed externally with a conical shoulder adapted to fit a correspondingly shaped portion of the hub-casing.

3. The improved free-wheel and brake 25 hub for bicycles, having its parts constructed, arranged and adapted to cooperate substantially as and for the purpose hereinbefore described with reference to the accompanying illustrative 30 drawing.

Dated this 15th day of March, 1923.

EDWARD EVANS & Co.,
27, Chancery Lane, London, W.C.,
Agents for the Applicant.

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[This Drawing is a reproduction of the Original on a reduced scale.]

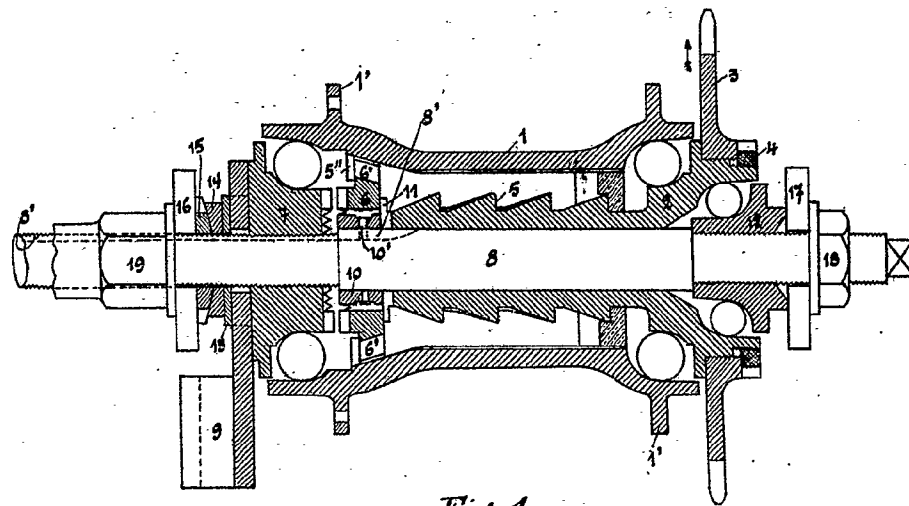


Fig. 1.

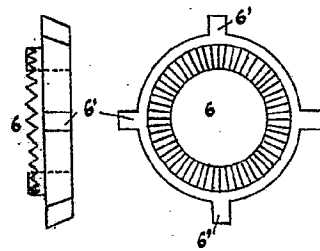


Fig. 4. Fig. 5.

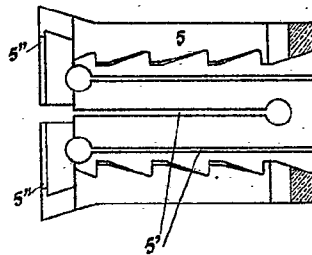


Fig. 2.

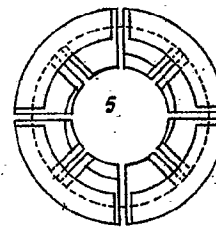


Fig. 3.